

# **Unidade V:**

## **Tipos Abstratos de Dados Flexíveis - Pilha**



**PUC Minas**

Adaptação dos slides elaborados pelo Instituto de Ciências Exatas e  
Informática - Departamento de Ciência da Computação

## • Celula.cs

```
class Celula
{
    private int elemento;
    private Celula prox;

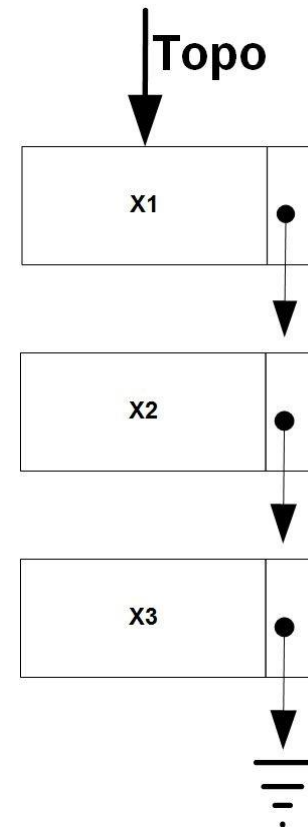
    public Celula(int elemento)
    {
        this.elemento = elemento;
        this.prox = null;
    }

    public Celula()
    {
        this.elemento = 0;
        this.prox = null;
    }

    public Celula Prox
    {
        get { return prox; }
        set { prox = value; }
    }

    public int Elemento
    {
        get { return elemento; }
        set { elemento = value; }
    }
}
```

- [Pilha.cs](#), criará instâncias como:

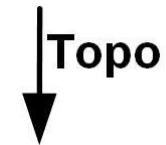


# Classe Pilha

```
class Pilha {  
    private Celula topo;  
    public Pilha () {  
        topo = null;  
    }  
    public void Inserir(int x) { ... }  
    public int Remover() { ... }  
    public void Mostrar() { ... }  
}
```

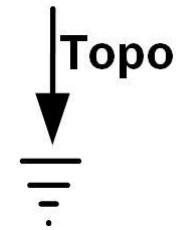
## Classe Pilha

```
class Pilha {  
    private Celula topo;  
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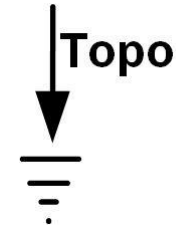
## Classe Pilha

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class Pilha {  
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        topo = null;  
    }  
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}
```



# Inserir (ou Empilhar ou push)

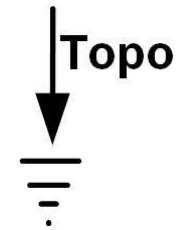
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class Pilha {  
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    }  
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    public int Remover() { ... }  
    public void Mostrar() { ... }  
}
```



```
public void Inserir(int x) {  
    Celula tmp = new Celula(x);  
    tmp.Prox = topo;  
    topo = tmp;  
    tmp = null;  
}
```

# Inserir (ou Empilhar ou push)

```
class Pilha {  
    private Celula topo;  
    public Pilha () {  
        topo = null;  
    }  
    public void Inserir(int x) { ... }  
    public int Remover() { ... }  
    public void Mostrar() { ... }  
}
```



```
public void Inserir(int x) { //Inserir(3)  
    Celula tmp = new Celula(x);  
    tmp.Prox = topo;  
    topo = tmp;  
    tmp = null;  
}
```



# Inserir (ou Empilhar ou push)

```

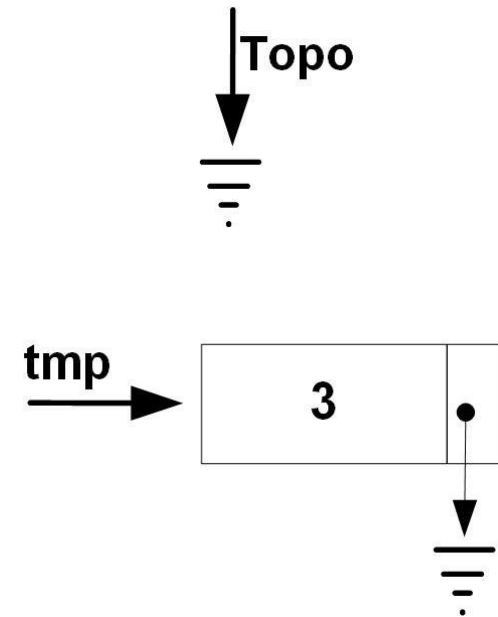
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```

```

public void Inserir(int x) { //Inserir(3)
    Celula tmp = new Celula(x);
    tmp.Prox = topo;
    topo = tmp;
    tmp = null;
}

```



# Inserir (ou Empilhar ou push)

```

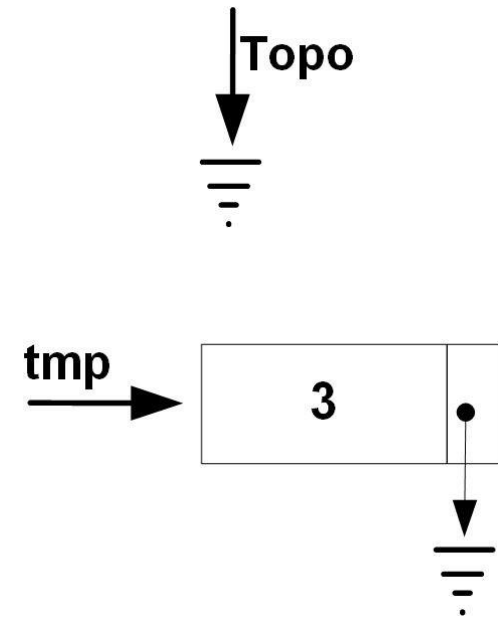
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}

```

```

public void Inserir(int x) { //Inserir(3)
    Celula tmp = new Celula(x);
    tmp.Prox = topo;
    topo = tmp;
    tmp = null;
}

```



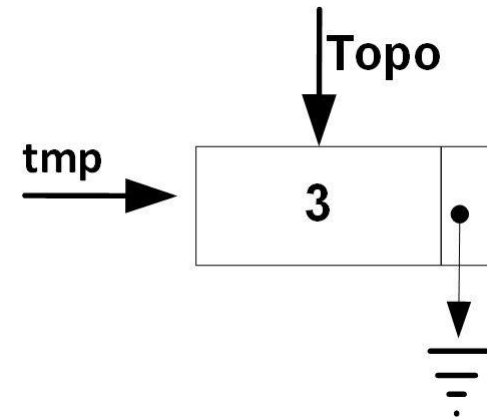
Como topo aponta para null, tmp.Prox continua apontando para null

# Inserir (ou Empilhar ou push)

```

class Pilha {
    private Celula topo;
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```



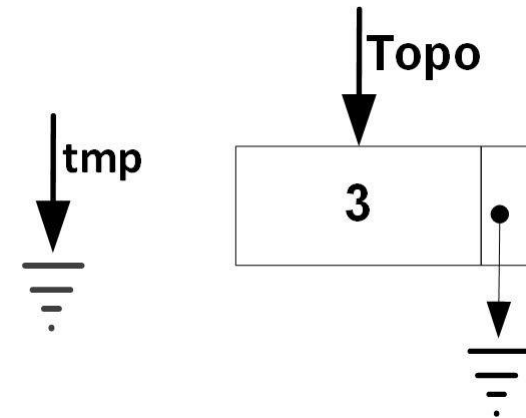
```

public void Inserir(int x) { //Inserir(3)
    Celula tmp = new Celula(x);
    tmp.Prox = topo;
    topo = tmp;
    tmp = null;
}

```

# Inserir (ou Empilhar ou push)

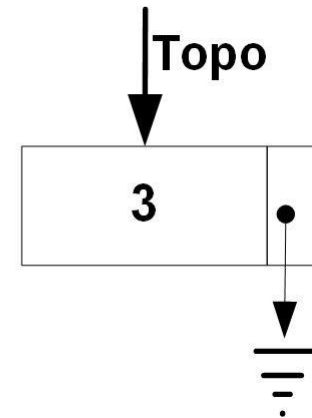
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class Pilha {  
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    public void Inserir(int x) { ... }  
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}
```



```
public void Inserir(int x) { //Inserir(3)  
    Celula tmp = new Celula(x);  
    tmp.Prox = topo;  
    topo = tmp;  
    tmp = null;  
}
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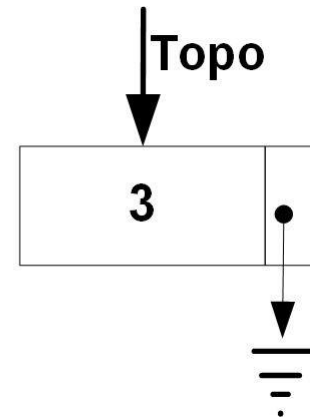
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class Pilha {  
    private Celula topo;  
    public Pilha () {  
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    }  
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}
```

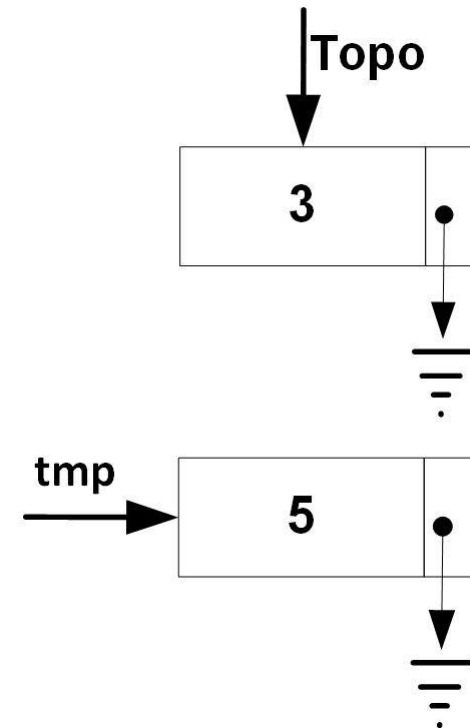


```
public void Inserir(int x) { //Inserir(5)  
    Celula tmp = new Celula(x);  
    tmp.Prox = topo;  
    topo = tmp;  
    tmp = null;  
}
```

# Inserir (ou Empilhar ou push)

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class Pilha {  
    private Celula topo;  
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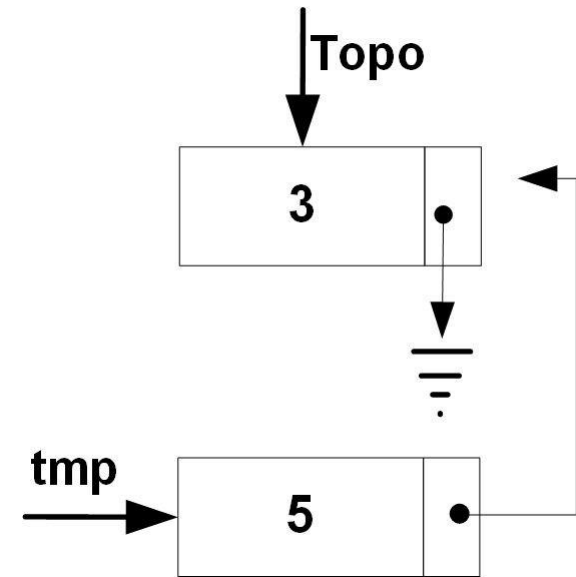
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```

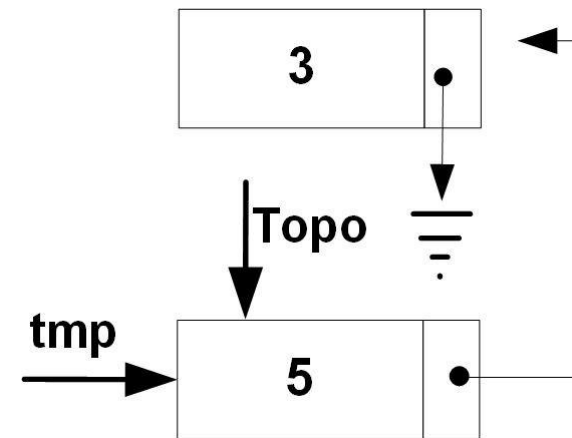
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```

public void Inserir(int x) { //Inserir(5)
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# Inserir (ou Empilhar ou push)

```

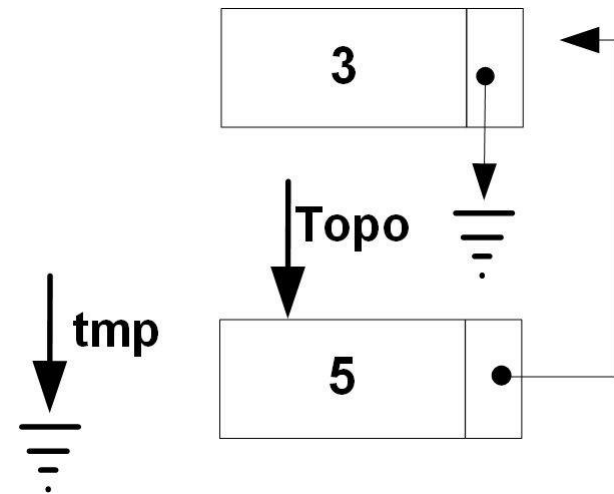
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```

```

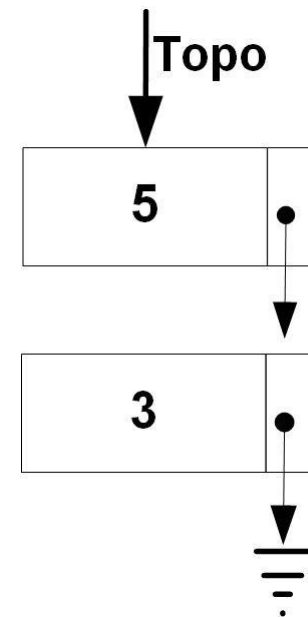
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```



## Classe Pilha

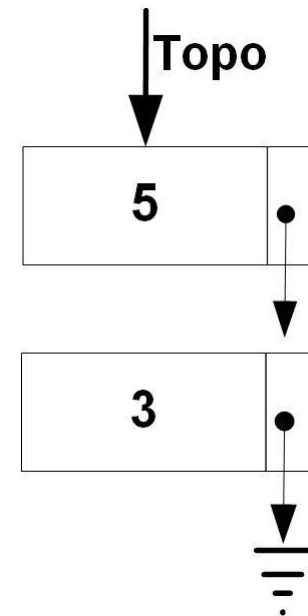
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}
```

```
public void Inserir(int x) { //Inserir(7)  
    Celula tmp = new Celula(x);  
    tmp.Prox = topo;  
    topo = tmp;  
    tmp = null;  
}
```



# Inserir (ou Empilhar ou push)

```

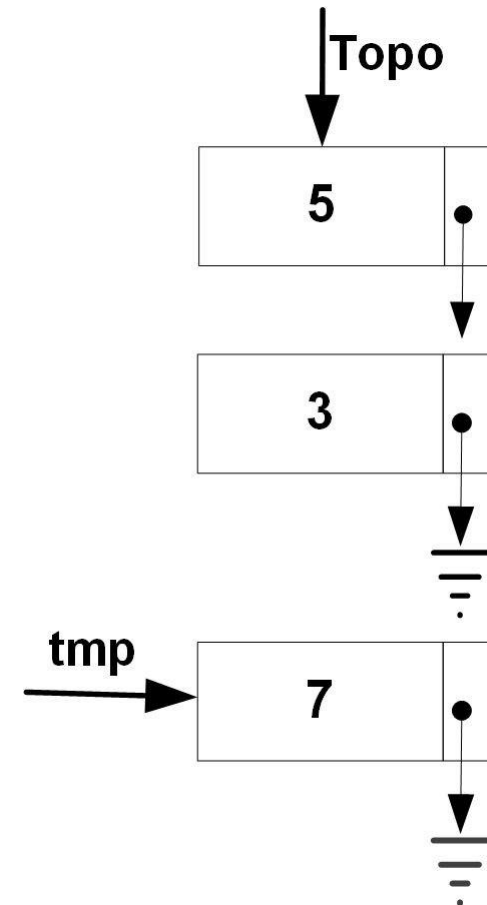
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public void Inserir(int x) { //Inserir(7)
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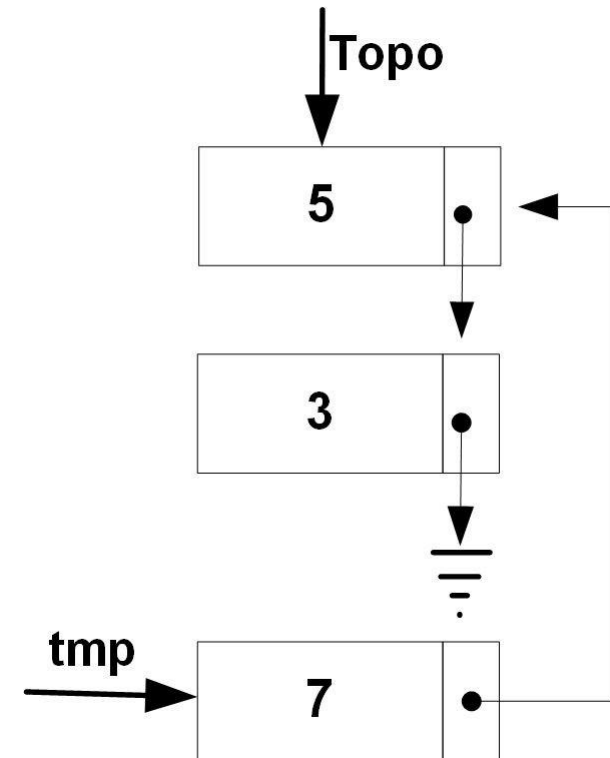
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```

```

public void Inserir(int x) { //Inserir(7)
    Celula tmp = new Celula(x);
    tmp.Prox = topo;
    topo = tmp;
    tmp = null;
}

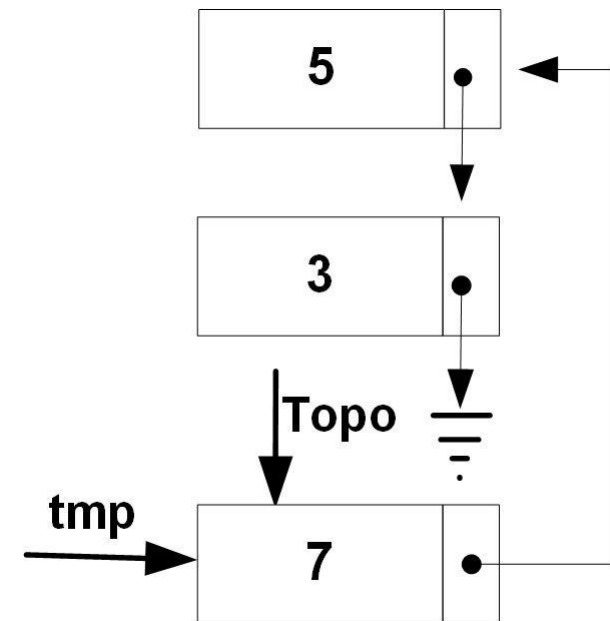
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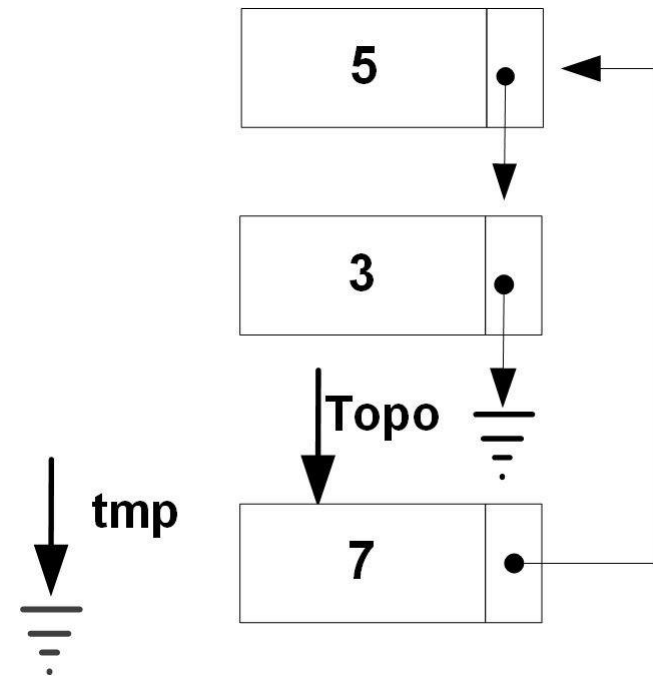
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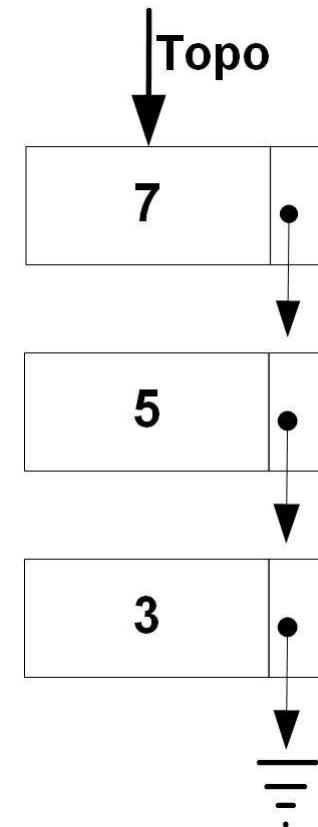
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## Classe Pilha

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# Remover (ou Desempilhar ou pop)

```

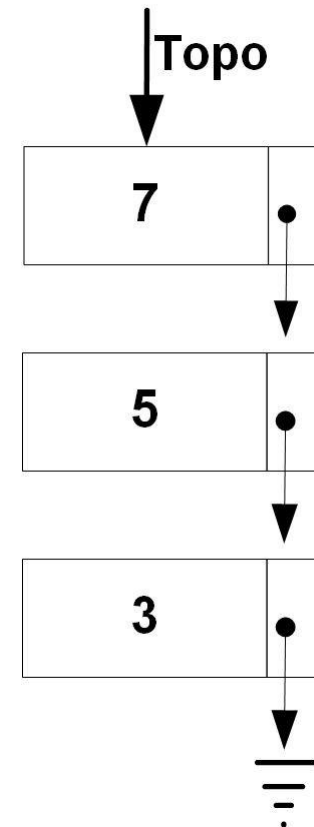
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}

```

```

public int Remover() {
    if (topo == null)
        throw new Exception("Erro!");
    int elemento = topo.Elemento;
    Celula tmp = topo;
    topo = topo.Prox;
    tmp.Prox = null;
    tmp = null;
    return elemento;
}

```



# Remover (ou Desempilhar ou pop)

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class Pilha {
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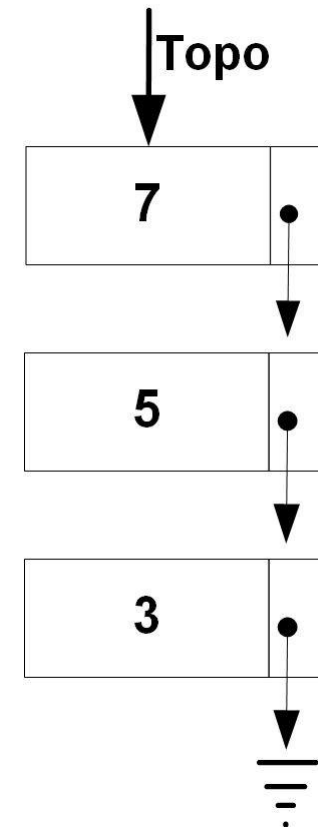
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    return elemento;
}

```

false



# Remover (ou Desempilhar ou pop)

```

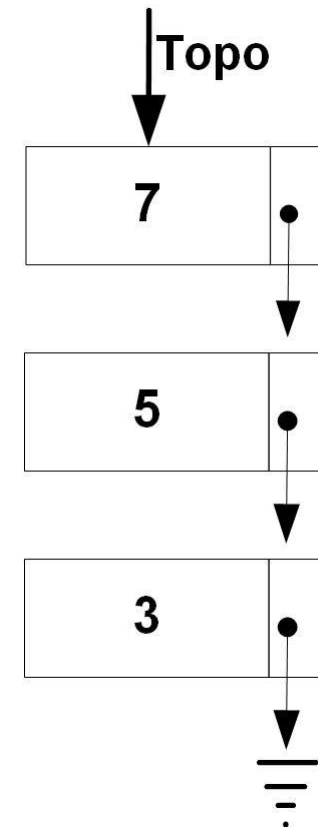
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```

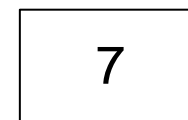
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```



Elemento



# Remover (ou Desempilhar ou pop)

```

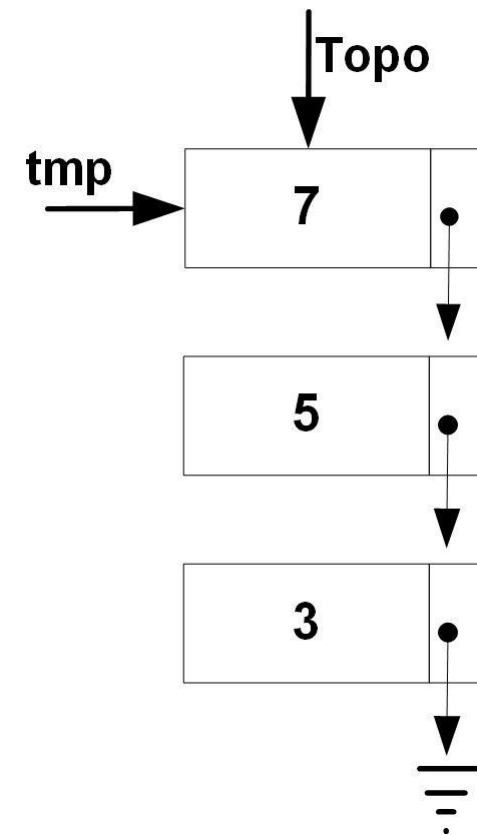
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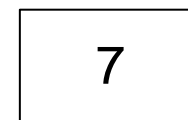
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```



Elemento



# Remover (ou Desempilhar ou pop)

```

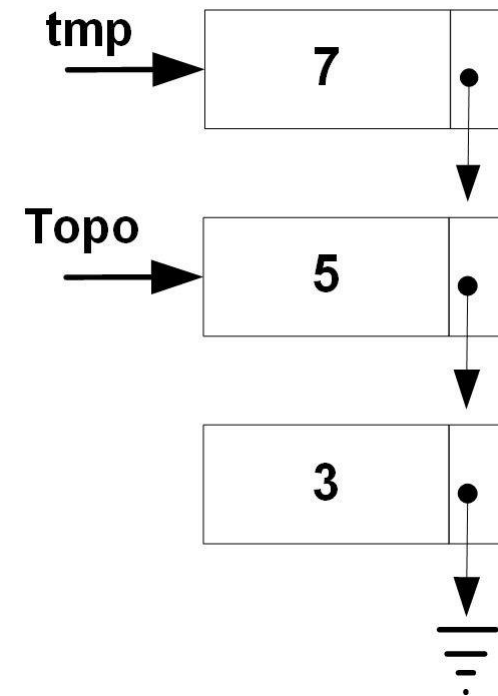
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```



Elemento

7

# Remover (ou Desempilhar ou pop)

```

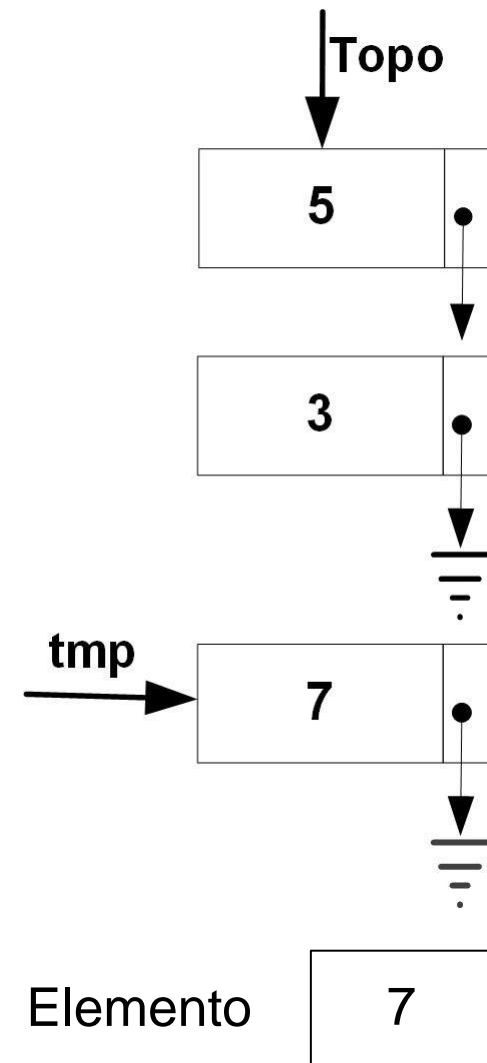
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# Remover (ou Desempilhar ou pop)

```

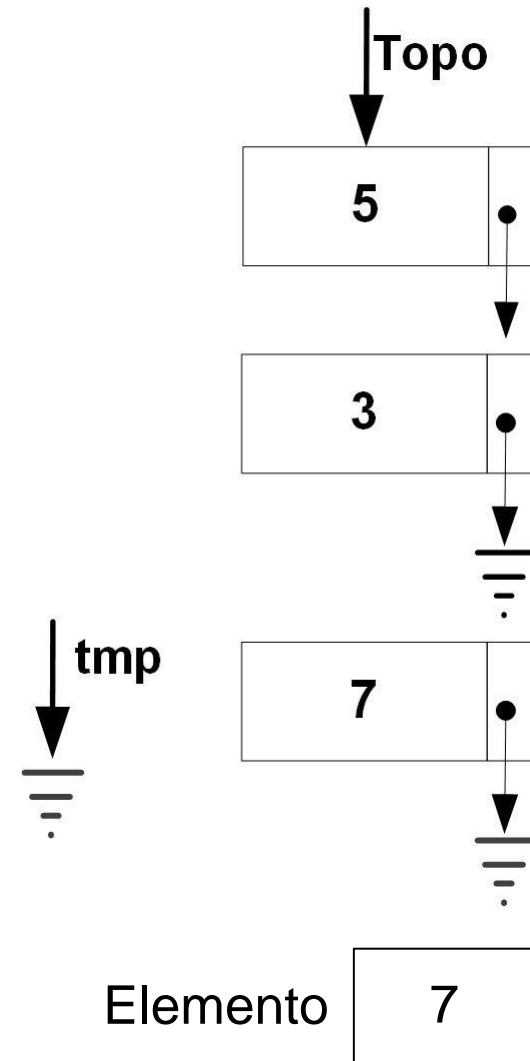
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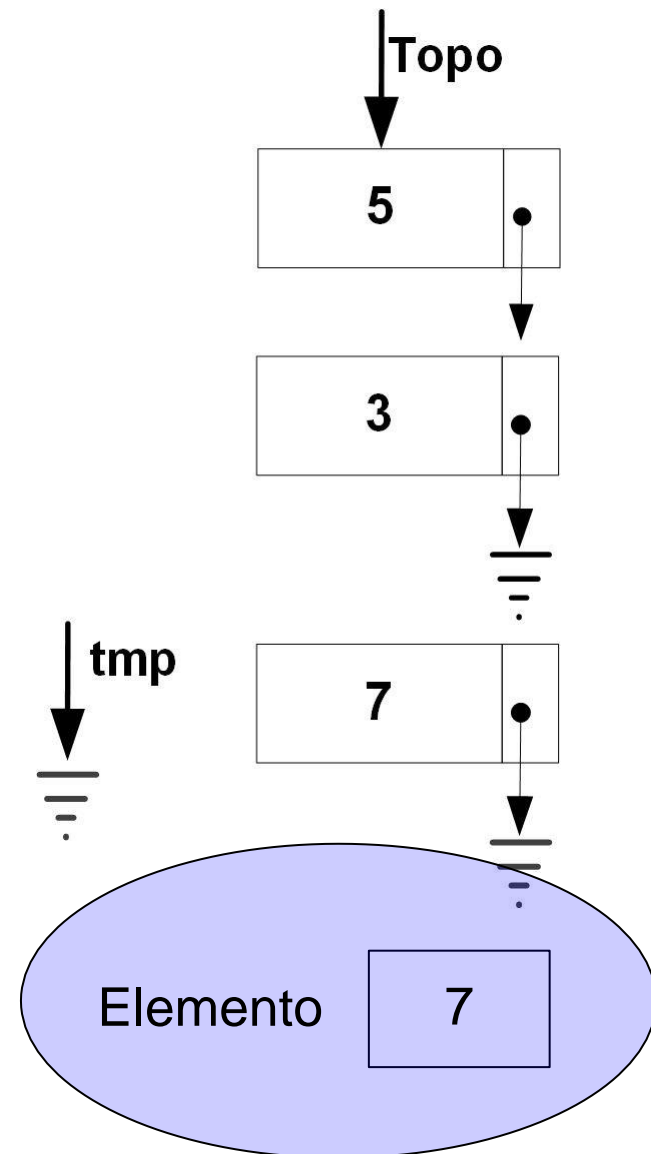
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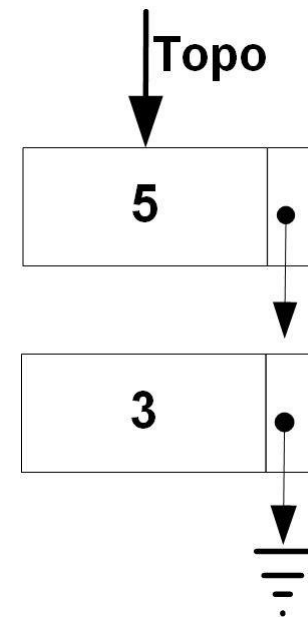
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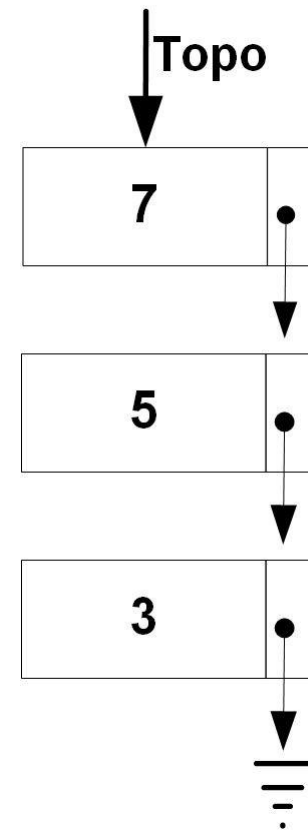
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```



```

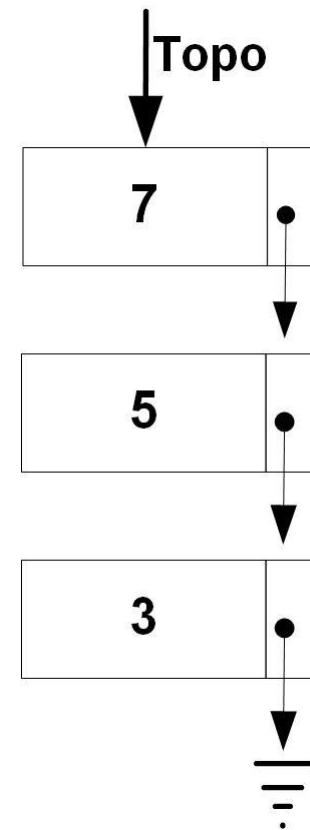
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
}

```

```

public void Mostrar() {
    Console.Write("[ ");
    for (Celula i = topo; i != null; i = i.Prox){
        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

```

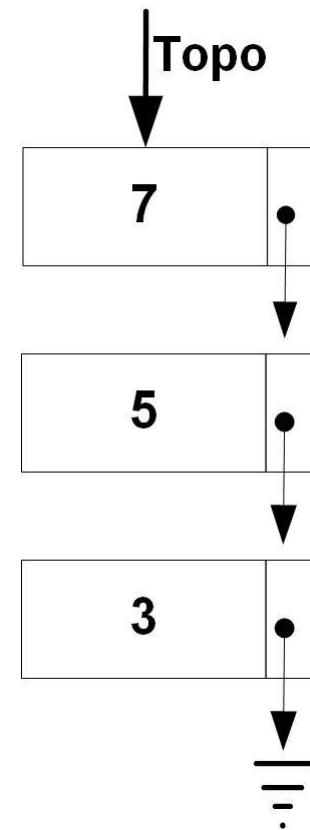
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
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}

```



Saída  
na tela

[

```

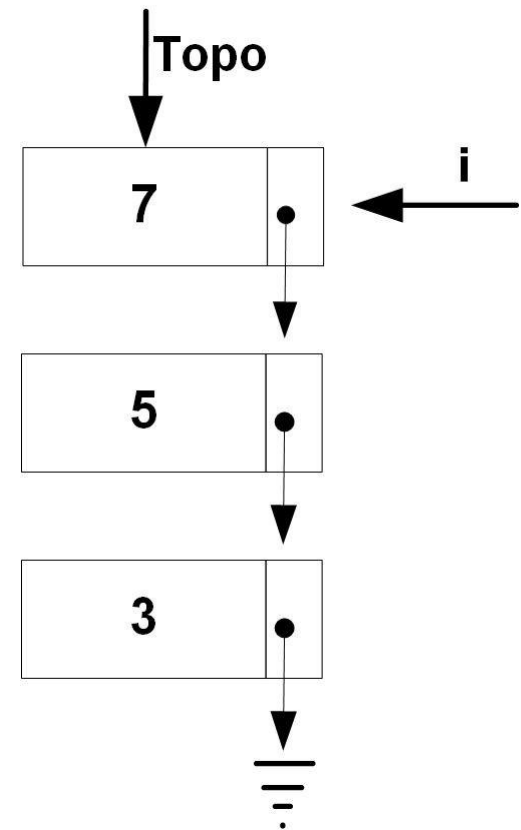
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
}

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public void Mostrar(){
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        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[

```

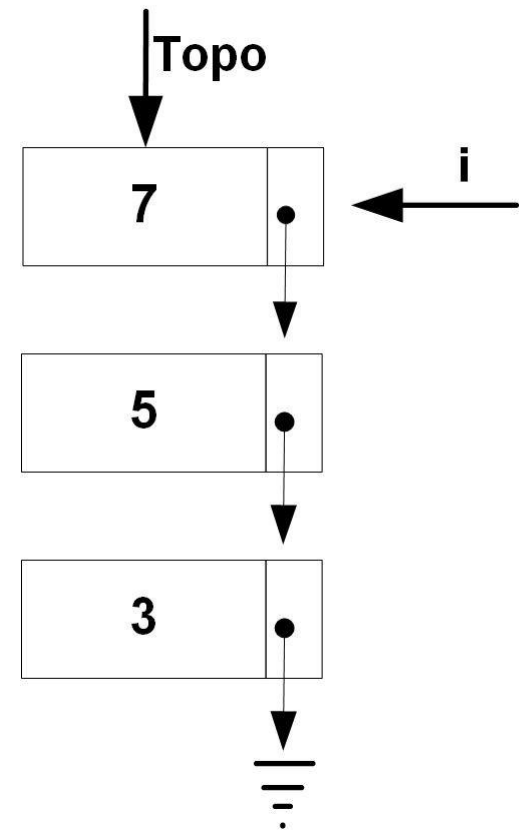
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
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```



Saída  
na tela

[

```

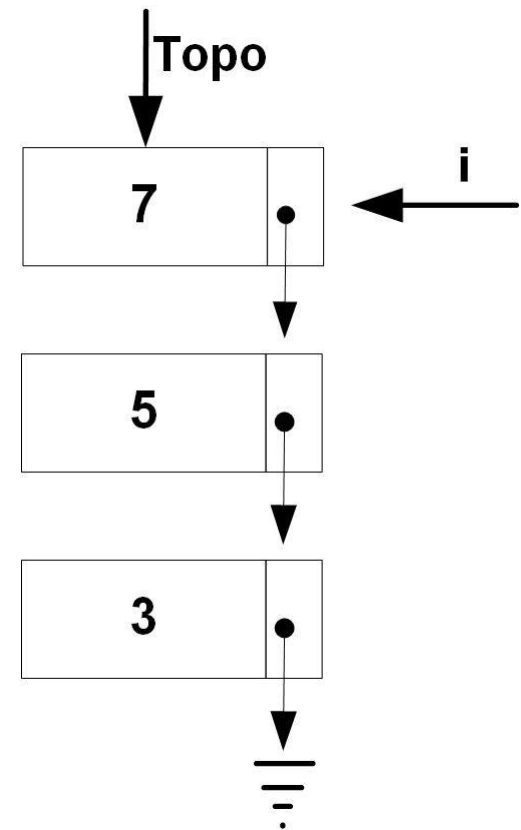
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    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
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```



Saída  
na tela

[ 7



```

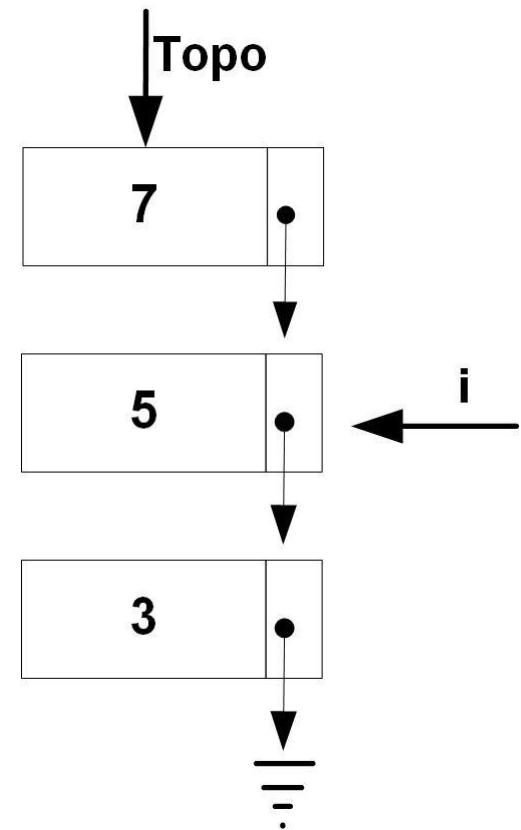
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
}

```

```

public void Mostrar() {
    Console.Write("[ ");
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        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7

```

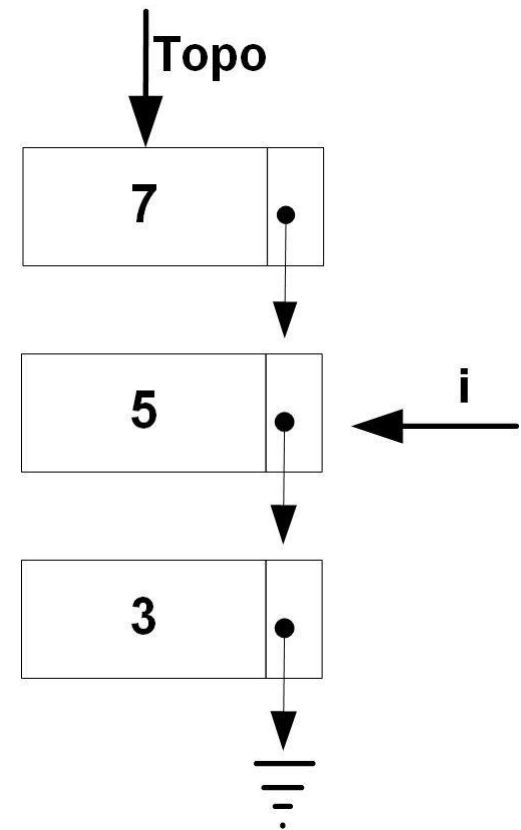
class Pilha {
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Saída  
na tela

[ 7

```

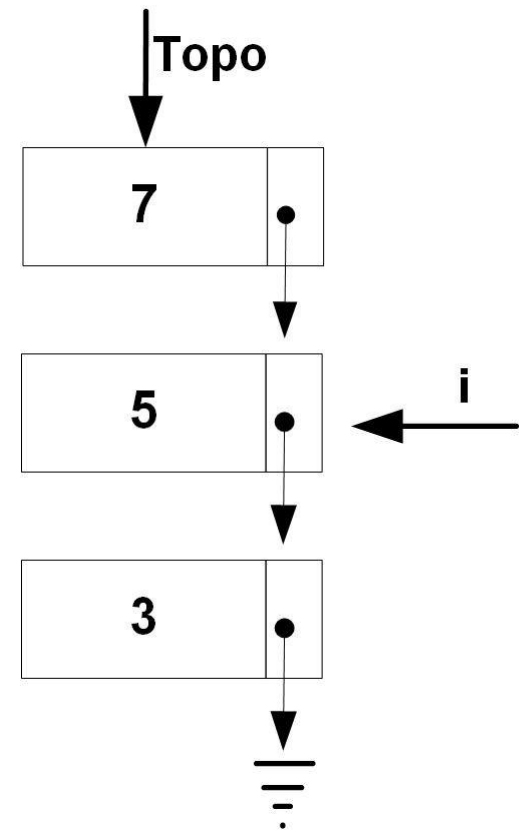
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        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7 5

```

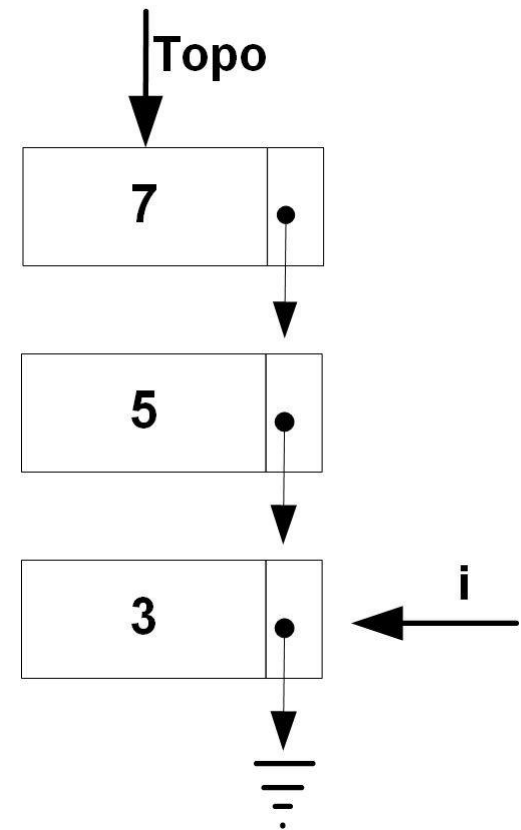
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
}

```

```

public void Mostrar() {
    Console.Write("[ ");
    for (Celula i = topo; i != null; i = i.Prox){
        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7 5

```

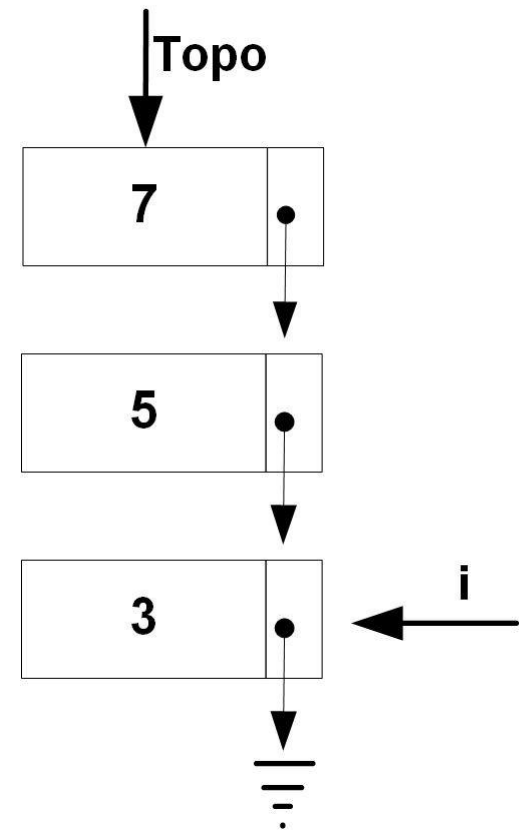
class Pilha {
    private Celula topo;
    public Pilha () {
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    }
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    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7 5

```

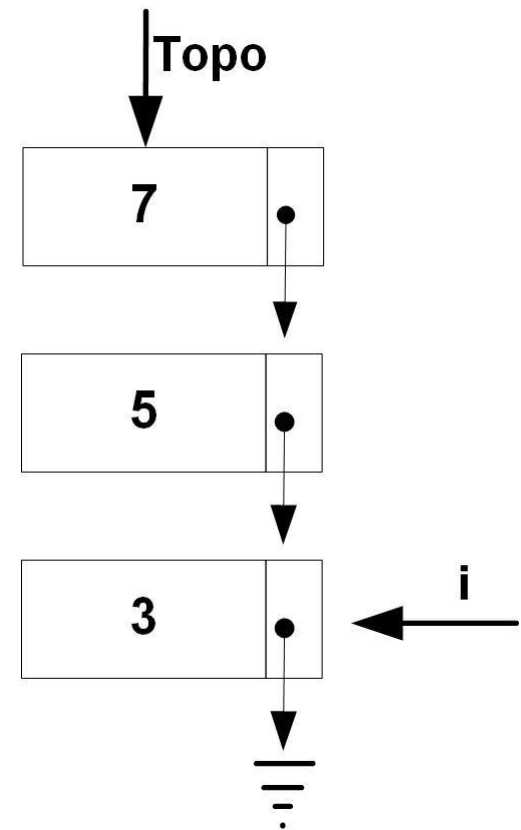
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}

```



Saída  
na tela

[ 7 5 3 ]

```

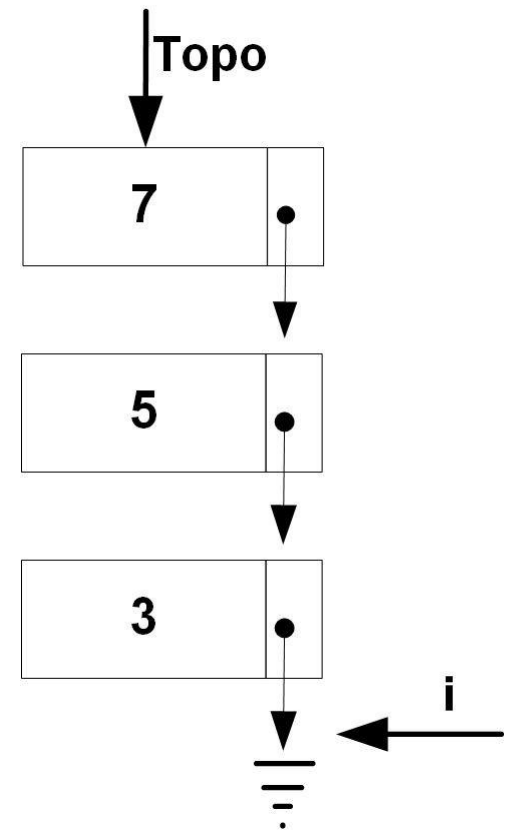
class Pilha {
    private Celula topo;
    public Pilha () {
        topo = null;
    }
    public void Inserir(int x) { ... }
    public int Remover() { ... }
    public void Mostrar() { ... }
}

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public void Mostrar() {
    Console.Write("[ ");
    for (Celula i = topo; i != null; i = i.Prox){
        Console.Write(i.Elemento + " ");
    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7 5 3

```

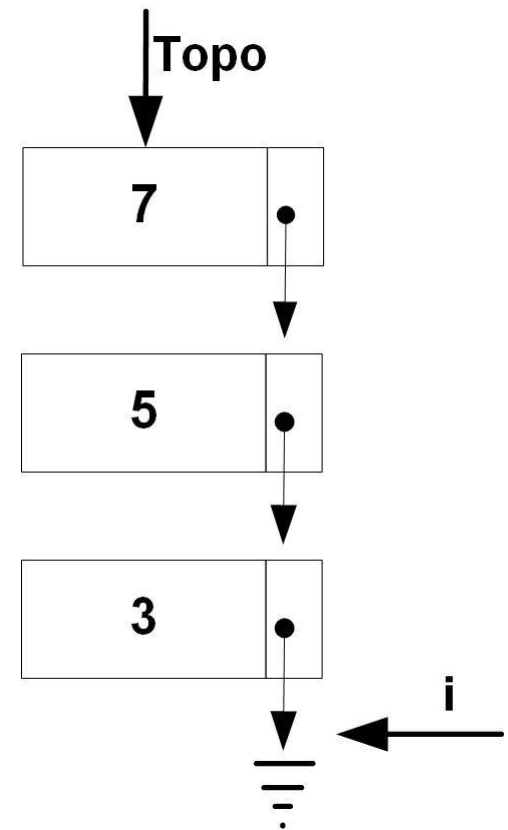
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    }
    Console.WriteLine("]");
}

```



Saída  
na tela

[ 7 5 3 ]



```

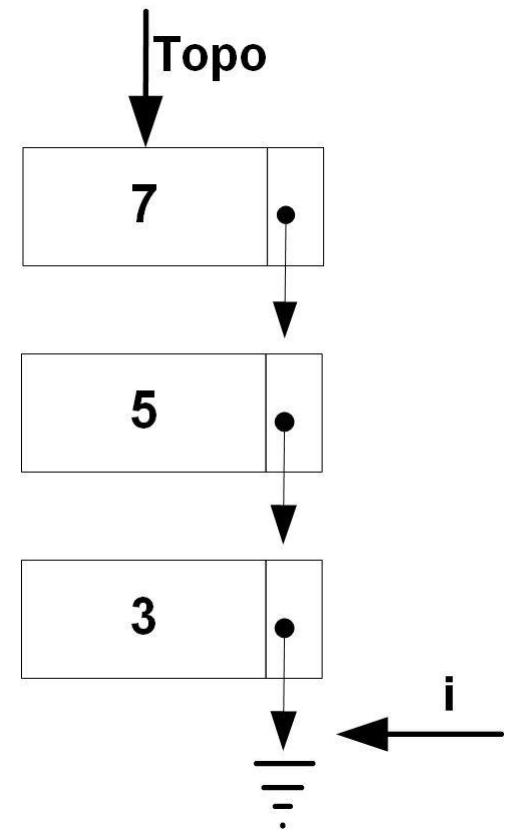
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Saída  
na tela

[ 7 5 3 ]